by the author from experiments by Messrs. Thomson and Joule, $T_0 = 272\frac{1}{2}°$ Centigrade $= 490\frac{1}{2}°$ Fahrenheit, a value which may be considered sufficiently correct for practical purposes.

The maximum theoretical efficiency of every conceivable thermodynamic engine receiving heat at the temperature T_1, and giving out heat at the temperature T_2, is

$$\frac{Q_1 - Q_2}{Q_1} = \frac{T_1 - T_2}{T_1 + T_0}.$$

The fourth section concludes with a system of formulæ, illustrated by numerical examples, for computing the power and efficiency of air-engines.

In the fifth section, the principles of the preceding sections are applied to aggregates consisting of heterogeneous substances, or of the same substance in different conditions, especially the aggregate of a liquid and its vapour; and the results are applied to the numerical computation of the theoretical efficiency of steam-engines.

Jan. 26, 1854.

The REV. BADEN POWELL, V.P., in the Chair.

1. A paper was read, entitled "On the Vibrations and Tones produced by the contact of bodies having different Temperatures." By J. Tyndall, Esq., F.R.S. Received Jan. 15, 1854.

The author introduces the subject of his paper by a brief description of the labours which have preceded his own, from the discovery of the phænomenon by Schwartz in 1805 to its revival and further examination by Trevelyan, Faraday, Forbes and Seebeck. The peculiar views of Prof. Forbes, who regards the effects as due to a new species of mechanical agency in heat, were the chief inducement to the resumption of the subject by the author. He examines the ground on which the theory of Prof. Forbes is based, and tests by experiment the general laws at which he has arrived. The first of these laws is, that "the vibrations never take place between substances of the same nature." By converting the cold metal on which the hot rocker is placed into a thin plate, fixing this plate in a vice, and causing the rocker to rest upon the edge of the plate, the author obtained vibrations with iron on iron, brass on brass, copper on copper, silver on silver, zinc on zinc, tin on tin; and thus shows the first law to be untenable. The second general law affirms that "both substances must be metallic." As exceptions to this law, the author adduces experiments made on about twenty non-metallic substances, with which perfectly distinct vibrations were obtained. Among those which signalize themselves by the force and permanence of the rockings they produce, are to be found rock-salt, fluor-spar and rock-crystal. With rockers similar to those described in the paper, and attending to the precautions there dwelt upon, vibrations and musical tones can be obtained without difficulty on these substances.

The third general law of Prof. Forbes states that "the vibrations are proportional within certain limits to the difference of the conducting powers of the metals for heat, the metal having the least conducting power being necessarily the coldest." The evidence adduced against the first law appears to destroy this one also. The author however proceeds further, and reverses the conditions deemed essential by Prof. Forbes. Silver stands at the head of conductors; using it as the *cold* metal, he has obtained distinct tones with hot rockers of brass, copper and iron, placed upon it. These and other experiments show that the third general law is, like the two others, untenable. Prof. Forbes further states that two of the metals, bismuth and antimony, are perfectly inert; the author has however obtained distinct tones with both of these substances. He finally enters also into an examination of the arguments of Prof. Forbes against the views supported by Faraday, and shows how the facts adduced against the said views become, when duly considered, strong corroborative evidence of their correctness.

1. "The following letter from Prof. Dove to the Earl of Rosse, was read from the Chair."

Berlin, Jan. 7, 1854.

My lord,—The vast stock of observations daily gathered by British Observatories for the promotion of terrestrial physics, always impressed me, as a scientific man, with gratitude towards a nation so worthy of the happy privilege of interrogating nature in every part of the globe. To day, at the receipt of the unhoped-for honour awarded to me by the Royal Society (the Copley Medal), for labours in a great measure grounded on those observations, I feel myself called upon to express a more personal, and still deeper, sense of gratitude. May I beg of your Lordship to communicate to the Council and the Society my most respectful thanks for the approbation bestowed upon the result of my exertions?

I am, my Lord,

Your Lordship's most obedient Servant,

To the Earl of Rosse, H. W. Dove.
President of the Royal Society.

2. "The following letter from Prof. Hansteen to Col. Sabine, was also read."

Observatory at Christiania, January 6, 1854.

Dear Sir,—At the end of last year I calculated formulæ of interpolation for different places in Europe, at which I had collected a sufficient number of observations of the magnetical inclination:

$$i=i_{\prime}+x+(t-t_0)y+(t-t_0)^2z, \quad \ldots\ldots\ldots\ldots \quad \text{(I.)}$$